FOSSIL INSECTS FROM ANTARCTICA*

By Frank M. Carpenter
Harvard University

The only fossil insects from Antarctica that have been formally described are two beetles, *Grahamelytron crofti* Zeuner and *Ademosynoides antarctica* Zeuner, both from a Jurassic deposit on Mount Flora, Hope Bay, Grahamland, at the northern tip of the Antarctic peninsula (Zeuner, 1959). Since these are known by isolated elytra, their family positions are obscure and conjectural at best.

Two other fossil insects from Antarctica have been reported in the literature but not named. One of these, a well preserved wing of "Permo-Carboniferous" age, was found in the Theron Mountains, near the Filchner Ice Shelf, during the Trans-Antarctic Expedition of 1955-58 (Plumstead, 1962). Unfortunately, the specimen appears to have been lost in the mail after it was consigned to Dr. Zeuner for study (personal communication, Dr. James Schopf), the only record of it being the photograph published by Plumstead. Although overlain by plant fragments, the wing was apparently well preserved and its venation could have been worked out satisfactorily from the specimen. Even the small, published photograph is sufficient to show that the insect was homopterous, although venational details are not clear enough to permit determination of family affinities.[1] Homoptera of this general type are not uncommon in Permian deposits in the Soviet Union, United States and Australia. The other specimen, a wing fragment of Permian age, was found in the Polarstar Formation of the Sentinel Mountains of Antarctica on the east slope of Polarstar Peak (Tasch and Riek, 1969). Despite the obscure nature of this fossil, Riek was led to conclude that it was a part of a homopterous fore wing, with a venation reminiscent of the family Stenoviciidae, known from the Permian and Triassic of eastern Australia and the Permian of Russia. My own, subsequent study of this specimen, made with the aid of ammonium chloride and under several different types of illumination, has revealed the presence of two additional longitudinal veins and numerous cross

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[1]Gressitt's suggestion (1967) that the fossil might be neuropterous is not really supportable.

veins, as well as a coarse rugosity of the wing membrane, not mentioned or shown by Riek. However, the fossil is still very fragmentary and although it might well be homopterous, its family position is most obscure.

Two additional fossil insects from Antarctica, one Jurassic and the other Permian, have been sent to me for study. Both are sufficiently well preserved to justify formal description and naming.

The Jurassic specimen is an odonate, collected from a pond deposit within the so-called Mawson Tillite on Carapace Nunatak, South Victoria Land.[2] It belongs to the suborder Anisozygoptera, which was a major one in the Jurassic Period, and to that complex of families which includes the Liassophlebiidae. The general venational pattern, the nature of the arculus, nodus and pterostigma, as well as the curvature of CuP and 1A, are very similar to those of *Liassophlebia.* There are some differences in the nature of the antenodal cross veins but, all details considered, it seems advisable to broaden our concept of the family Liassophlebiidae to include the antenodal structure of the Antarctic species, for reasons given below, rather than to establish another family. The new specimen does clearly represent an undescribed genus and species.

Caraphlebia Carpenter, new genus

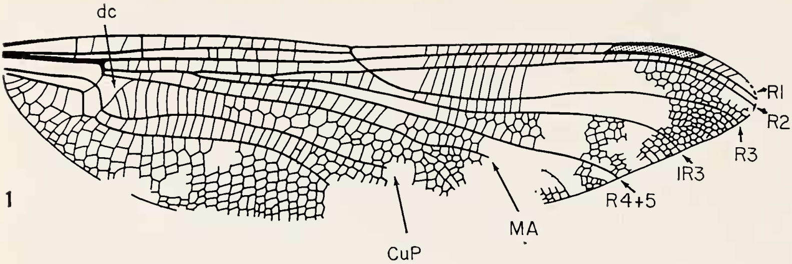
This is related to *Liassophlebia,* but the hind wing has several weak antenodals in addition to the two strong, primary ones. The venation is much like that of *Liassophlebia* (see figures 1 and 3) but the cross veins between R2 and R3, proximally, are long and apparently not interrupted by transverse connections; the space between MP and CuA is very narrow; IR2 apparently arises more distally than in *Liassophlebia;* and the anal area of the wing is small. The shapes of the discoidal cell, subdiscoidal cell, CuP and 1A are very much as in *Liassophlebia.*

Type species: *Caraphlebia antarctica,* n. sp.

Caraphlebia antarctica Carpenter, n. sp.
Figure 1

Hind wing: length of wing, 40 mm; width, at level of arculus, 8 mm. Primary antenodals very well developed, the costal and subcostal elements aligned; the other antenodals weak and indistinct, but under glycerin-alcohol eleven are visible in the costal area and seven in the subcostal area, none aligned; pterostigma long and

[2]Basaltic lavas enclosing the fossiliferous pond deposit are presently being dated by the Potassium/Argon method.



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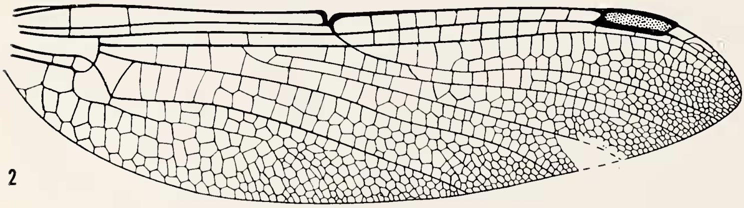

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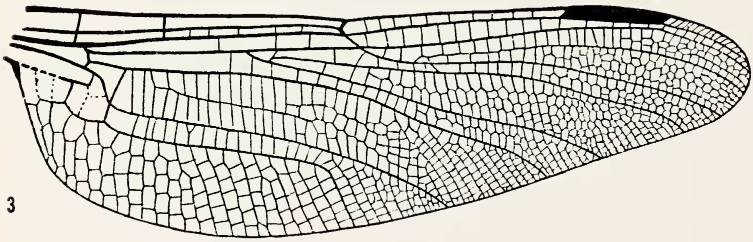

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Figure 1. *Caraphlebia antarctica* n.sp. Drawing based on holotype, collected on Carapace Nunatak, Antarctica. Sc, subcosta; R1, radius; R2, R3, IR3, R4+5, branches of radial sector; MA, anterior media; CuP, posterior cubitus; dc, discoidal cell. Length of wing, 40 mm.

Figure 2. *Turanothemis nodalis* Pritykina. Drawing based on holotype (hind wing), Jurassic of Karatau, USSR (from Pritykina, 1968).

Figure 3. *Liassophlebia mirabilis* Tillyard. Drawing based on holotype (hind wing), Jurassic of England (from Tillyard, 1925).

slender; $R_4 + 5$ arising slightly nearer to the arculus than to the nodus; other venational details are shown in figure 1.

Holotype: No. 165874, U. S. National Museum, Smithsonian Institution, Washington; found in rock forming part of the "Mawson Tillite" and collected on Carapace Nunatak, Antarctica, by H. W. Borns, Jr. and B. A. Hall.[3] The rock matrix is part of a volcanic mudflow and it includes many remains of Conchostraca, Ostracoda, and other Crustacea, as well as numerous body fragments of insects; the latter are unidentifiable even to ordinal level, though some appear to be parts of aquatic nymphs (possibly mayflies or stoneflies). The plants of the Carapace Nunatak tillite are cycads and conifers and they are indicative of Jurassic age (Townrow, 1967). This is consistent with the occurrence of the family Liassophlebiidae, which is known only from Jurassic deposits.

The specimen consists of a single wing, quite clearly but peculiarly preserved. The wing has been torn just beyond the nodus in such a way as to make it difficult to trace the subnodal vein, although its approximate position is obvious in the fossil. As a result of tearing along the posterior margin, the distal portions of the veins in the posterior half of the wing are not perfectly aligned with the basal portions, though the amount of shift is not uniform. Nevertheless, the use of large photographs has enabled the preparation of a drawing of the wing, shown in figure 1; this drawing includes only those structures that are visible in the fossil, except for the very apex, which is indicated by dotted lines. One of the peculiar features of this specimen is the preservation of the veins on the two counterparts: apparently, the convex veins are well preserved on one half and the concave veins on the other. Such a separation of the convex and concave veins can be duplicated in Recent insect wings by separating the two membranes just after the adult has developed its wings or by the use of caustic potash. Some wing veins in the fossil are only faintly indicated on the rock but they become very clear if the specimen is moistened with alcohol or glycerin-alcohol. The thin antenodals, for example, cannot be discerned unless the fossil is treated in this way. It is possible that the use of glycerin-alcohol on the specimens of *Liassophlebia,* which are in the British Museum, might also reveal the presence of faint antenodals in the costal area, since they do occur in the subcostal area (Tillyard, 1925). Even if this should prove not to be the case, the similarities between the wings of *Liassophlebia* and *Cara-*

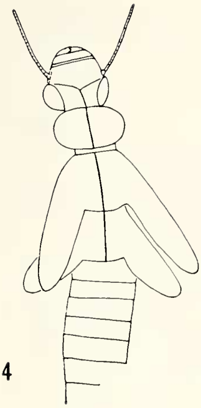
[3]For the location of this Nunatak, see Borns and Hall, 1969, p. 871, fig. 1.

phlebia are so marked that family separation of these genera seems unwarranted.

A related genus, *Turanothemis* (see figure 2), has recently been described by Pritykina from the Jurassic of Karatau (Kazakhstan) in the Soviet Union and has been assigned to a separate family, Turanothemistidae (Pritykina, 1968). In her account of this family, the author makes no comparisons with any other specific family, simply stating that it differs sharply from all other families of this series of Anisozygoptera by the presence of only the two primary antenodals in the costal area and by the form of the discoidal cell in the hind wings. However, in *Liassophlebia*, as already noted, only the two primary antenodals have been reported (Tillyard, 1925) and its discoidal cell (hind wing) has precisely the same form as that of the fossil on which *Turanothemis* is based. Since no other distinguishing characteristics of the Turanothemistidae are discernible, I consider the family Turanothemistidae inseparable from the Liassophlebiidae, which, on this basis, is known from Jurassic deposits of England, Siberia and Antarctica.

The new Permian insect, found in conchostracan-bearing beds of the Mount Glossopteris Formation, Ohio Range, is a small but well preserved nymph. Since very little is known of nymphal forms of Paleozoic insects and especially since no venational pattern is discernible in the wing pads, the ordinal affinities of the fossil cannot be determined with any degree of certainty. However, the specimen is very close to a Permian nymph, *Uralonympha* Zalessky, described from Tchekarda, in the Ural Mountains of the USSR, and similar to another, *Permoleuctropsis* Martynov, from a Permian deposit near Orenburg, USSR. The similarity of the new nymph to *Uralonympha* is especially strong in the form of the prothorax and the position of the wing pads (see figure 6). The Antarctic species is accordingly being assigned to the genus *Uralonympha*, in preference to making another separate genus that could not be satisfactorily distinguished from *Uralonympha* at the present state of our knowledge.

The ordinal position of these nymphs is conjectural. *Uralonympha* has generally been considered an immature form of a stonefly (Zalessky, 1935; Sharov, 1962) but there is an equally good possibility that it belongs to the Protorthoptera. Until a series of such nymphs has been found in association with numerous adults, the affinities of *Uralonympha* and other little-known nymphs of the Paleozoic will remain obscure. For the present, *Uralonympha* is best considered a member, *incertae sedis*, of the order Perlaria.



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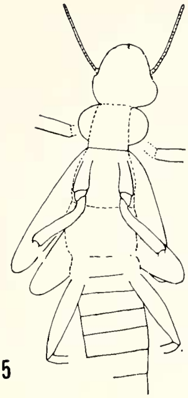

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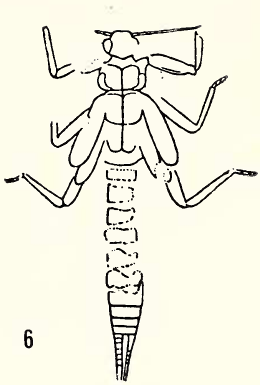

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Figure 4. *Uralonympha schopfi* n.sp. Drawing based on holotype, showing dorsal view of insect; collected at *Leaia* Ledge, Ohio Range, Antarctica.

Figure 5. *Uralonympha schopfi* n.sp. Drawing of holotype, showing ventral view.

Figure 6. *Uralonymph varica* Zalessky. Drawing based on holotype, Permian of Tchekarda, Ural Mountains, USSR (from Zalessky, 1939).

The following is a description of the nymph from the Ohio Range:

Uralonympha schopfi Carpenter, n. sp.
Figures 4 and 5

Based on a single specimen of a nymph, complete except for the last four or five abdominal segments. Length of specimen as preserved, from the clypeus to the posterior edge of the sixth abdominal segment, 8 mm; antennae slender, 2.5 mm. long, showing 21 segments, though the basal few segments are not discernible; eyes prominent, bulging, width across the eyes 0.7 mm; clypeus prominent and mandibles large; pronotum oval, 2.2 mm. wide, 1.4 mm. long; mesothorax 1.7 mm. long, metathorax 1.3 mm. long. Fore wing pad about 3 mm. long; hind wing pad 2.5 mm. long.

The pronotum resembles that of *Uralonympha* in being distinctly oval. The legs are considerably more robust than those of *Uralonympha*. The fore legs are little known but the meso- and metathoracic legs are preserved as far as the femora; they show a distinct and rather large coxa, a small trochanter and well developed femur. The dimensions of the legs and their segments are as follows: mesocoxa, 1.1 mm.; mesotrochanter, .3 mm.; mesofemur, 1.7 mm.;

metafemur, 2 mm. The abdominal segments are of equal size, 1.5 mm. long. Since the terminal portion of the abdomen is not preserved, the cerci are not included in the fossil.

Holotype: No. 165875, U. S. National Museum; collected by Dr. James Schopf, for whom the species is named (field no. ANT 67-1-a&b); it was found in a small piece of carbonaceous shale, bleached to white by weathering (*Leaia* Zone), west face, Mercer Ridge, Ohio Range, 84°50'S, 113°45'W; conchostracans and a typical *Glossopteris* flora occur in the same shale, which is considered to be late or middle Permian in age (Doumani and Tasch, 1965). The fossil is extraordinarily well preserved and if the specimen were an adult insect, the venational details would have allowed precise determination of its systematic position.

Both of the new fossils described herein are indicative of the presence of productive insect-bearing deposits in Antarctica and the excellent preservation of these particular specimens justifies further exploration of the deposits concerned, with special reference to insect remains.

Acknowledgments

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